

### **REMARKS**

This application has been amended. In particular, claim 13 has been amended to further define the solution used in the process by incorporating into claim 13 the limitation previously appearing in claim 15 and, additionally, defining the concentration range of the peroxide. Claim 20 now defines the hypohalous acid concentration. Newly added claims 23-25 further define the concentration levels. Support for these amendments can be found in the application as originally filed, such as in the paragraph beginning on line 15 of page 3 as well as in the Examples section. New claims 26 and 27 include the back-flush flow rate limitation which previously appeared in claims 13 and 20, respectively. Claims 17 and 18 have been amended to reflect the changes made to claim 13. No new matter has been added by these amendments. Claim 15 has been cancelled. Accordingly, claims 13, 16-18 and 20-27 are pending, of which claims 13 and 20 are in independent form. In view of the foregoing amendments and following remarks, Applicants submit that the pending claims are patentable over the cited art of record and the application is in condition for allowance.

Claims 13, 15, 17, 18 and 20-24 stand rejected under 35 U.S.C. 103(a) for obviousness over Mol et al. (U.S. Patent No. 6,274,186) in view of Jennings (U.S. Patent No. 3,912,624) and Fremont et al. (U.S. Patent No. 4,740,308). Claim 16 stands rejected under 35 U.S.C. 103(a) for obviousness over Mol in view of Jennings and Fremont and further in view of Doddema et al. (U.S. Patent No. 5,667,690). In particular, the Office Action contends it would be obvious at the time applicant invented the claimed process to use the process of Mol to back flush the membrane disclosed by Jennings since back flushing a membrane is known in the art for removal of contaminants from the surface of membranes. (Office Action, page 4.) The Office Action further contends that polymer membranes such as disclosed in Fremont are known to be used for filtering beverages containing proteins and polyphenols and, additionally, that Fremont recognizes that polymer membranes can be cleaned with peroxide at a pH of between 8.5 to 11. *Id.* However, for the following reasons, Applicants respectfully submit that the asserted combination of references would not be made by one skilled in the art and, moreover, that even if such combination would be made, it would not obviate the presently claimed invention.

Applicants first note that rejections based on the process described in Mol have previously been overcome during prosecution of this application. Specifically, the Office Action of November 3, 2008 advanced several rejections based on PCT Publication No. WO 97/45523 to Mol et al., which is equivalent to U.S. Patent No. 6,274,186 to Mol et al. Applicants successfully overcame the rejections based on the PCT publication of Mol through the amendments and arguments dated May 4, 2009. For the same reasons, Applicants submits that the rejections based on Mol are improper.

Mol is directed to a process which uses a combination of a cyclic nitroxyl compound (TEMPO and derivatives thereof) and a hypohalite. The present invention, on the other hand, is directed to a TEMPO-free process. Mol does not teach or suggest a TEMPO-free process. Instead, Mol focuses solely on a process that uses TEMPO. In fact, Mol warns against the use of a TEMPO-free process by describing the detriments of conventional, non-TEMPO based cleaning techniques. (Mol, col. 1, lines 63-67.) The Mol process is therefore clearly not a TEMPO-free process as is the process of the present invention and Mol actually teaches away from such a TEMPO-free process.

This understanding of Mol is confirmed by the attached Declaration Under 37 CFR Section 132 of Dr. Jan Matthijs Jetten (“Jetten Declaration”), a named inventor on the subject application and an experienced expert in the field. Dr. Jetten is familiar with both the Mol U.S. Patent and the Mol PCT Publication. (Jetten Declaration, ¶ 4.) Dr. Jetten is also aware of the methods of cleaning filters described in the introductory part of Mol. (Jetten Declaration, ¶ 8.) At the time the present invention was developed, Dr. Jetten was aware of the recommendation of Mol to use the known oxidation catalyst TEMPO to create a TEMPO-mediated (or catalyzed) process. *Id.* Dr. Jetten believed, based on personal experience as well as familiarity with the Mol document that such a TEMPO-mediated process would work. *Id.* However, the concern was that the high chlorine levels of chlorine and bromine that would result from the Mol process could leave chlorinated and brominated residues in the filter, which may conflict with safety provisions for food processes. (Jetten Declaration, ¶ 8.) Moreover, as Dr. Jetten explains, TEMPO is a nitroxide which is a compound not generally accepted in the food and beverage industry. *Id.* Dr. Jetten thus developed the present invention as an alternative to

the TEMPO-mediated process of Mol. Therefore, the TEMPO-mediated process of Mol is considerably different from the process of the present invention.

Jennings and Fremont would not suggest to one skilled in the art to modify the Mol process from a TEMPO-catalyzed process into a TEMPO-free process for cleaning a polymer membrane filter containing residues from filtering beverages such as is now claimed. With respect to Jennings, the Office Action appears to rely on Jennings as suggesting to one skilled in the art to employ a back-flush technique in the Mol process to flush the membrane. However, as confirmed by Dr. Jetten, Jennings is not compatible with Mol or a process for cleaning a polymer membrane filter containing residues from filtering beverages in the first place. Specifically, Jennings is concerned with reverse osmosis and ultrafiltration, each of which is, as Dr. Jetten states, “unsuitable for the filtration of beer, since these techniques would result in the loss of valuable components such as certain proteins and affect oxygen uptake.” (Jetten Declaration, ¶ 11.) With respect to the discussion in Jennings related to the removal of molds and bacteria in the food dairy industry, Dr. Jetten explains that during the filtration of beer, which is one substance filtered according to the presently claimed invention, complexes of otherwise soluble or dispersible polyphenols and proteins crystallize at low temperatures whereby the polyphenols adhere to the membrane by covalent interaction. *Id.* Thus, the materials which are treated in the dairy process can be very different than the materials treated in the process of the present invention. *Id.* Dr. Jetten fails to see “how, even with the knowledge of today, Jennings et al. could have put us on the track of the instantly claimed invention.” *Id.* Therefore, Jennings would not suggest to one skilled in the art to proceed against the clear teachings in Mol to develop a TEMPO-free process for cleaning a polymer membrane filter containing residues from filtering beverages according to the claimed invention.

With respect to Fremont, the Office Action asserts that Fremont teaches a process of cleaning fouled separation membranes by contacting with an inorganic peroxide and rinsing with alkali metal hydroxide. Fremont, however, is directed to the cleaning of ultrafiltration members. Ultrafiltration members are not suitable for filtering beer and other beverages for the reasons discussed above related to Jennings. (See Jetten Declaration, ¶ 12.) Moreover, the concentration of the cleaning agents in Fremont is considerably above the concentration level

now defined in the claims. Claim 13, for example, defines the peroxide concentration range as from 200 to 5000 ppm. On the other hand, comparative Example 8 of Fremont, for instance, uses acidic hydrogen peroxide in the amount of 4.1%, which translates to 41,000 ppm. (Fremont, Comparative Example 8, Table I.) Examples 1-3 of Fremont, which are presumably the agents which meet the invention of Fremont, are also highly concentrated, such as 7.5-30% hydrogen peroxide followed by concentrated (5.25%) hypochlorite. As Dr. Jetten puts it, Fremont uses “highly concentrated” agents. (Jetten Declaration, ¶ 12.) Such high concentrations of these cleaning agents is prohibitive for cleaning in the beverage and beer industry because of the high cost and large volume of water needed for rinsing as well as because the membranes used are sensitive to such oxidizing agents. *Id.* Thus, Fremont, which is primarily concerned with membrane treatment in the pulp and paper manufacturing industry, would also not suggest that one deviate from the clear teachings of Mol and employ a TEMPO-free process or otherwise modify Mol to arrive at the present invention, especially given the highly-concentrated solutions employed in Fremont.

With respect to claim 16, Doddema is cited as allegedly suggesting the inclusion of a polyamine into the Mol process. However, this would not cure the other clear deficiencies of Mol. Particularly, Doddema would not suggest that one use a TEMPO-free process.

Accordingly, the rejection of claims 13, 15, 17, 18 and 20-24 under 35 U.S.C. 103(a) for obviousness over Mol in view of Jennings and Fremont, as well as the rejection of claim 16 under 35 U.S.C. 103(a) for obviousness over Mol in view of Jennings and Fremont and further in view of Doddema should be reconsidered and withdrawn.

Claims 13-15, 17-18 and 23 stand rejected under 35 U.S.C. 103(a) for obviousness over Jennings in view of Fremont and Schuchardt (U.S. Patent No. 4,970,308). In view of the foregoing amendments and following remarks, this rejection is respectfully traversed.

Jennings, and particularly the differences between Jennings and the present application, is discussed above. Moreover, the passage of Jennings relied on in the Office Action provides only a very general discussion of the use of cleaning solutions, as the focus of Jennings is on the use of water droplets to clean membranes. Thus, Jennings fails to provide many of the details recited in the claims, including the use of a transition metal selected from manganese and

iron or the use of a peroxide solution with a peroxide concentration within the range from 200 to 5000 ppm.

Fremont is relied on as allegedly teaching a process of cleaning fouled separation membranes by contacting them with an inorganic peroxide and rinsing with alkali metal hydroxide. (Office Action, page 6.) The differences between Fremont and the present invention are discussed above, particularly with respect to the fact that Fremont suggests the use of highly concentrated solutions. Moreover, Fremont is concerned with the cleaning of ultrafiltration members, and particularly those used in the pulp and papermaking industry. Ultrafiltration members are not suitable for filtering beer and other beverages, nor are the highly concentrated solutions of Fremont useful in this setting. The Office Action appears to appreciate that Fremont does not suggest the cleaning of residues collected from filtering beverages. (Office Action, page 6.) Applicants submit that, for the reasons discussed above, Fremont is not compatible with a process of cleaning residues collected from filtering beverages, nor would one skilled in the art appreciate the teachings in Fremont to be useful in this capacity. (Jetten Declaration, ¶ 12.)

Schuchardt is cited in the Office Action as suggesting that it would be obvious to incorporate a transition metal catalyst agent into the process of Jennings to degrade higher molecular weight to lower molecular weight poly impurities. (Office Action, pg. 6.) However, this is not a fair application of the Schuchardt reference. As summarized in the Jetten Declaration, Schuchardt describes the treatment of waste water issuing from the production of polyether polyols, which are described in Schuchardt as polyethoxylated glycerols of, e.g., the formula  $A-OCH_2-CH(O-A)-CH_2O-A$  where A is  $(CH_2-CH_2O)_n-H$  with n in the order of 40. (Jetten Declaration, ¶ 13.) Such polyether polyols are synthetic, flexible, water-soluble polymers having a very limited number of hydroxyl groups. *Id.* These polyols have nothing to do with polyphenols, which are plant-derived, natural, aromatic products with limited solubility. *Id.* Given these clear disparities between what is discussed in Schuchardt (i.e. polyether polyols) and what is the subject matter of the claimed process (cleaning water-insoluble proteins and/or polyphenols), Dr. Jetten's opinion of the Schuchardt patent is that it would be of no use in addressing the problems addressed through the present invention. Thus, reliance on Schuchardt in the Office Action, and particularly for the proposition that Schuchardt would suggest to one

skilled in the art a manner of degrading water-insoluble proteins and/or polyphenols residues, is inconsistent with what one skilled in the art would actually glean from the Schuchardt reference.

Accordingly, the rejection of claims 13-15, 17-18 and 23 under 35 U.S.C. 103(a) for obviousness over Jennings in view of Fremont and Schuchardt should be reconsidered and withdrawn.

Claims 20-22 and 24 stand rejected under 35 U.S.C. 103(a) for obviousness over Jennings in view of Fremont. This rejection is also respectfully traversed. The discussion of the many deficiencies of Jennings and Fremont appears above and will not be repeated herein. In short, Jennings does not suggest a process of cleaning a polymer membrane filter containing residues from filtering beverages by contacting the residues with a hypohalous acid solution where the hypohalous acid is used at a concentration within the range from 200 to 5000 ppm. Fremont does not cure the deficiencies of Jennings, and actually suggests concentrations higher than the 200 to 5000 ppm range defined in the claims. Accordingly, the rejection of claims 20-22 and 24 under 35 U.S.C. 103(a) for obviousness over Jennings in view of Fremont should be reconsidered and withdrawn.

The present application also contains evidence of unexpected results, which further supports Applicants' position that the invention is patentable over the cited art. When looking for alternatives to the TEMPO-catalyzed bromide/hypochlorite oxidation of Mol, Dr. Jetten and his colleagues noted the finding in Mol that oxidation with non-catalyzed hypochlorite or hypobromite or with peroxide/metal complexes was unsatisfactory. (Jetten Declaration, ¶ 9.) Due to this teaching in Mol, Dr. Jetten initially focused on oxidizing agents not mentioned by Mol, such as peroxydisulfate and complex persulfates. *Id.* While these solutions allowed for somewhat acceptable cleaning, the flux rates were not exactly ideal. *Id.* Some of these results are displayed in the subject application, such as in Examples 1.3 (peroxydisulphate) and 1.5 (Ozone). *Id.* Using these solutions in the back-flush mode allowed for only slight improvement in the cleaned flux rate. (Jetten Declaration, ¶ 9.)

However, as described by Dr. Jetten, it was surprising to discover, given the teachings of Mol, that a filter cleaned with a process using hypohalous acid without a catalyst had a high flux rate when cleaned, especially when the back-flush occurred with relatively low

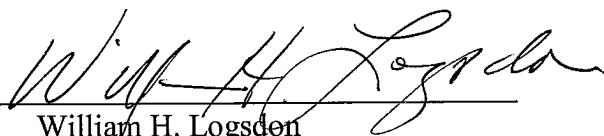
pH values. (Jetten Declaration, ¶ 10.) These surprisingly high flux rates are reported in Examples 1.1, 1.2, 2.3, 2.4 and 3.5 of the subject application, with Example 3.5 showing a flux rate of the same order (62 and 72 ml/s) as the original flux of 70 ml/s. *Id.* Similarly, it was found that using a TEMPO-free metal/peroxide solution, such as in Examples 3.1-3.4, 4.2 and 4.3, exhibited surprisingly beneficial flux rates. *Id.* These high fluxes were even obtained using direct oxidant concentrations that were significantly below those used in Mol, as shown in Examples 3.2 and 3.4. *Id.* As Dr. Jetten concludes, “[w]e never expected such results with a TEMPO-free process on the basis of the teaching of Mol et al.” (Jetten Declaration, ¶ 10.)

Therefore, the pending claims are patentable over the cited art of record.

### **CONCLUSION**

For the foregoing reasons, Applicants submit that the pending claims are patentable over the cited art of record and are in condition for allowance. Accordingly, reconsideration of the outstanding rejections and allowance of pending claims 13, 16-18 and 20-27 are respectfully requested.

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